FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES

FIT PROJECT

TASK REPORT TO THE ENVIRONMENTAL PROTECTION AGENCY CONTRACT NO. 68-01-6056

GROUNDWATER CONTAMINATION BY TRICHLOROETHYLENE

East Woburn, Massachusetts

INTERIM REPORT

October 13, 1981
TDD No. F1-8110-01

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Prepared by: Ecology and Environment, Inc.
Field Investigation Team (FIT)
Region 1

Submitted to: John Hackler

ecology and environment, inc.

International Specialists in the Environmental Sciences

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Contributors

Ecology and Environment, Inc.
Region 1 Field Investigation Team

TDD # F1-8110-01

Groundwater Contamination by Trichloroethylene

East Woburn, Massachusetts

The following Region 1 Field Investigation Team members made major contributions to this study in the capacities noted:

Project Manager	-	David Cook
Hydrogeology	-	David Cook
Hydrogeology	-	Richard DiNitto
Chemistry	-	Paul Clay

SECTION 1 - INTRODUCTION

This interim report describes the work performed to date concerning contamination of groundwater with trichloroethylene in the portion of the Woburn, Massachusetts study area outlined in Figure 1. The following work has been performed by the Ecology and Environment, Inc. (E & E) Region I FIT;

1. All water wells in the study area were inventoried and all available well log data gathered.

2. A base map was prepared.

3. A topographic map was prepared.

4. A seismic study was performed.

5. A preliminary bedrock surface contour map was prepared.

6. A preliminary water table elevation contour map was prepared.

7. Sampling and analysis of all accessible wells was performed.

8. A map showing the areal extent of groundwater contamination by trichloroethylene was prepared.

As a result of the above background work, sites for additional monitoring wells were selected to better define the contamination plumes in East and North Woburn. Twenty-two additional wells have been installed and preliminary screening for volatile organic contamination has been performed by E & E.

A summary of the information gathered to date regarding the northeast portion of the study area is presented in this report. Some preliminary conclusions are presented as a guide for additional tasking.

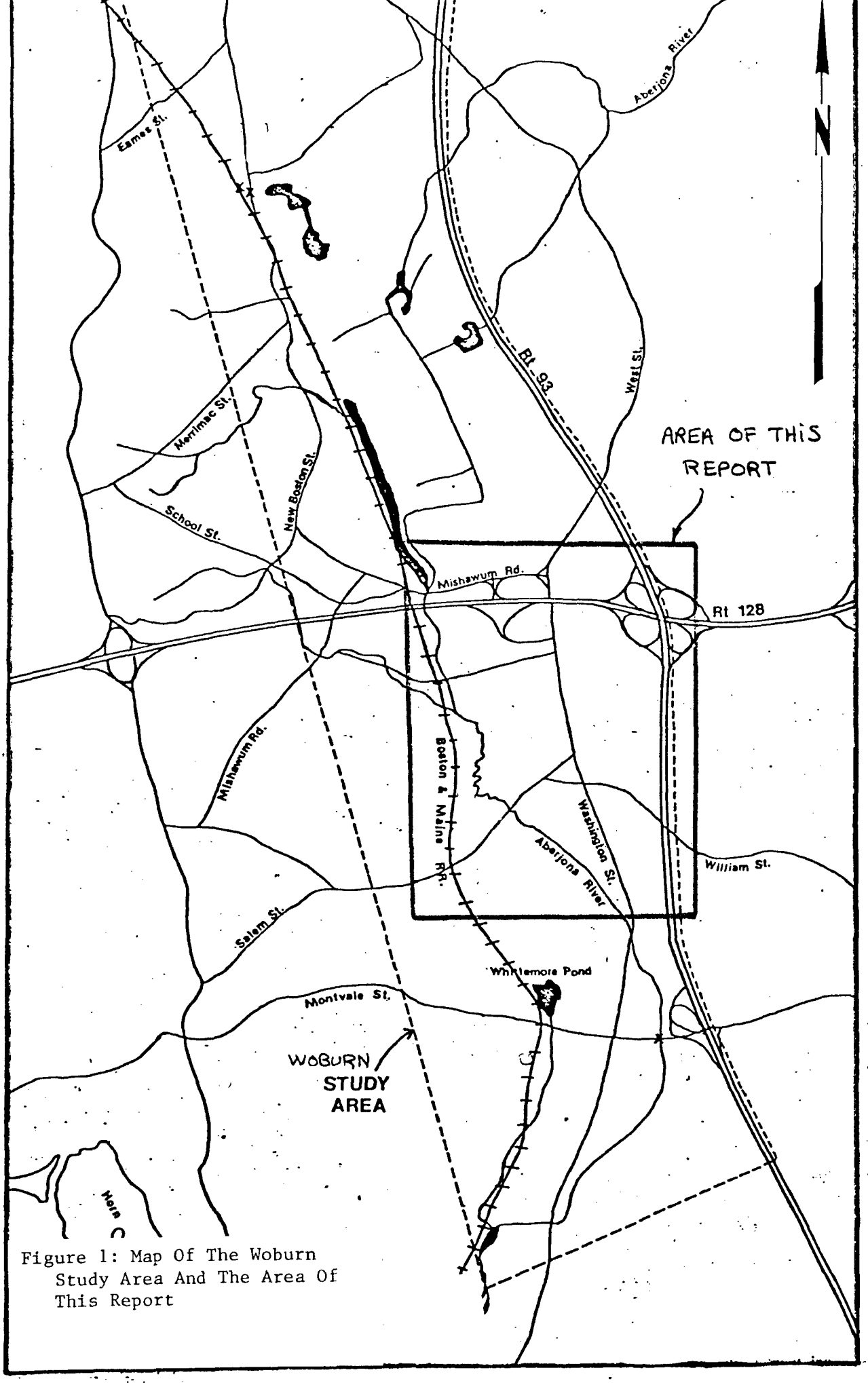

Figure 1: Map Of The Woburn Study Area And The Area Of This Report

SECTION 2 - BEDROCK SURFACE CONFIGURATION

Figure 2 depicts the bedrock surface configuration of the area outlined in Figure 1. Bedrock surface elevations were established from historical well logs, bedrock surface exposures, a seismic survey, and from the newly installed monitoring wells. The most prominent bedrock feature is a deep, narrow trough which trends approximately northwest-southeast and parallels the Aberjona River. This trough lies beneath the aquifer in East Woburn. Town water supply wells 419 (city well G) and 420 (city well H) are located within this trough. Another important feature is a bedrock high near the intersection of Route 128 and Washington Street. The associated ridge extends southward as far as well W21.

East of this bedrock high, the bedrock slopes gently southwesterly with two poorly defined troughs. One trough lies beneath the intersection of Routes 128 and 93, and the other trough is just south of the bedrock ridge associated with wells W21 and W22C. Both troughs trend roughly northeast-southwest.

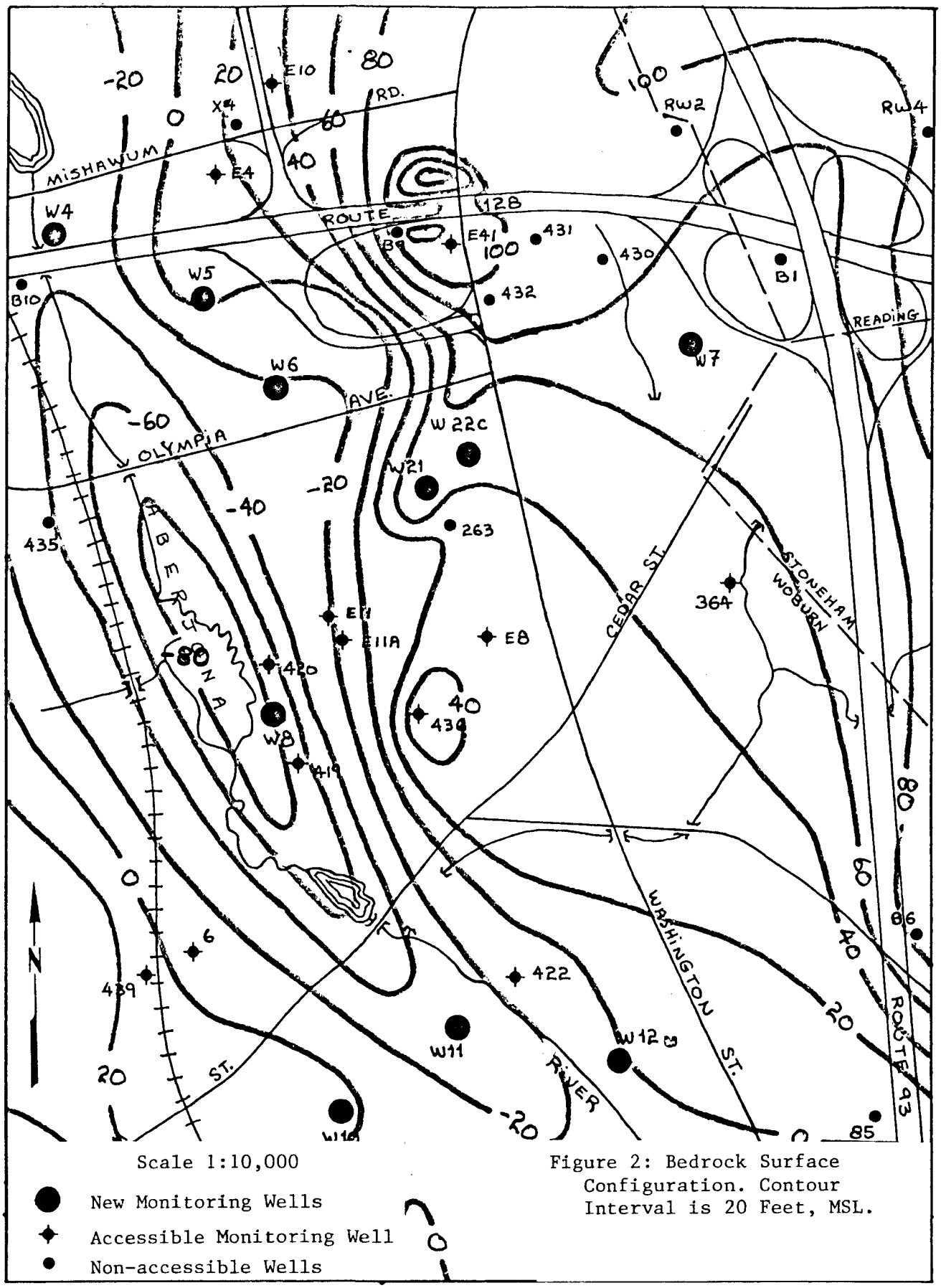

Figure 2: Bedrock Surface Configuration. Contour Interval is 20 Feet, MSL.

SECTION 3 - WATER-TABLE CONFIGURATION

Figure 3 depicts the known configuration of the water table in the portion of the study area outlined in Figure 1. Elevations of the water table are based on historical water table measurements for late winter and spring conditions, taken from the U.S.G.S. Hydrologic Data Report No. 21 (1980).

Groundwater flows perpendicular to the water table contours as shown by the arrows in Figure 3. The regional flow through the East Woburn aquifer is from the north to the southeast roughly parallel to and directly above the major bedrock trough. On either side of the bedrock trough, the groundwater flows nearly perpendicular to the regional flow until intercepted by it.

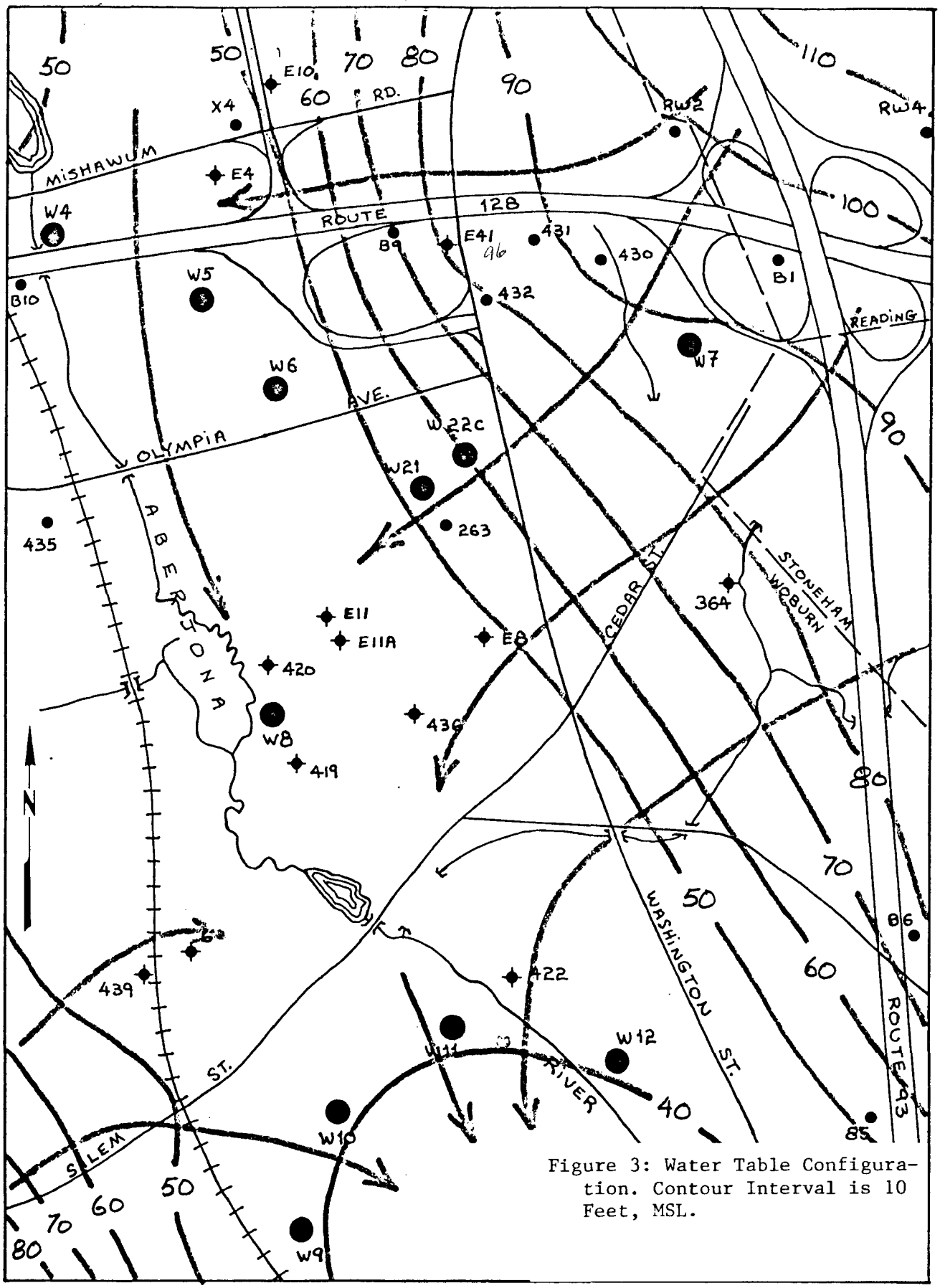

Figure 3: Water Table Configuration. Contour Interval is 10 Feet, MSL.

SECTION 4 - GROUNDWATER QUALITY CHARACTERIZATION

The first round of groundwater sampling and priority pollutant analyses detected trichloroethylene in 27 wells at concentrations up to 2300 ppb. The areal distribution of this compound is plotted on Figure 4. A major area of contamination is present southwest of the intersection between Routes 128 and 93; the same area shown in Figures 2 and 3. This plume of contamination trends roughly north-northeast to south-southwest with the highest levels of trichloroethylene to the southwest.

During drilling of additional monitoring wells, the Region I FIT utilized a portable Organic Vapor Analyzer (OVA) to measure levels of volatile organics within soil and groundwater samples. The OVA, when used as gas chromatograph has the capabilities of detecting and identifying volatile organic compounds. Detection of volatile organic compounds at several of the new monitoring wells is described in Table 1.

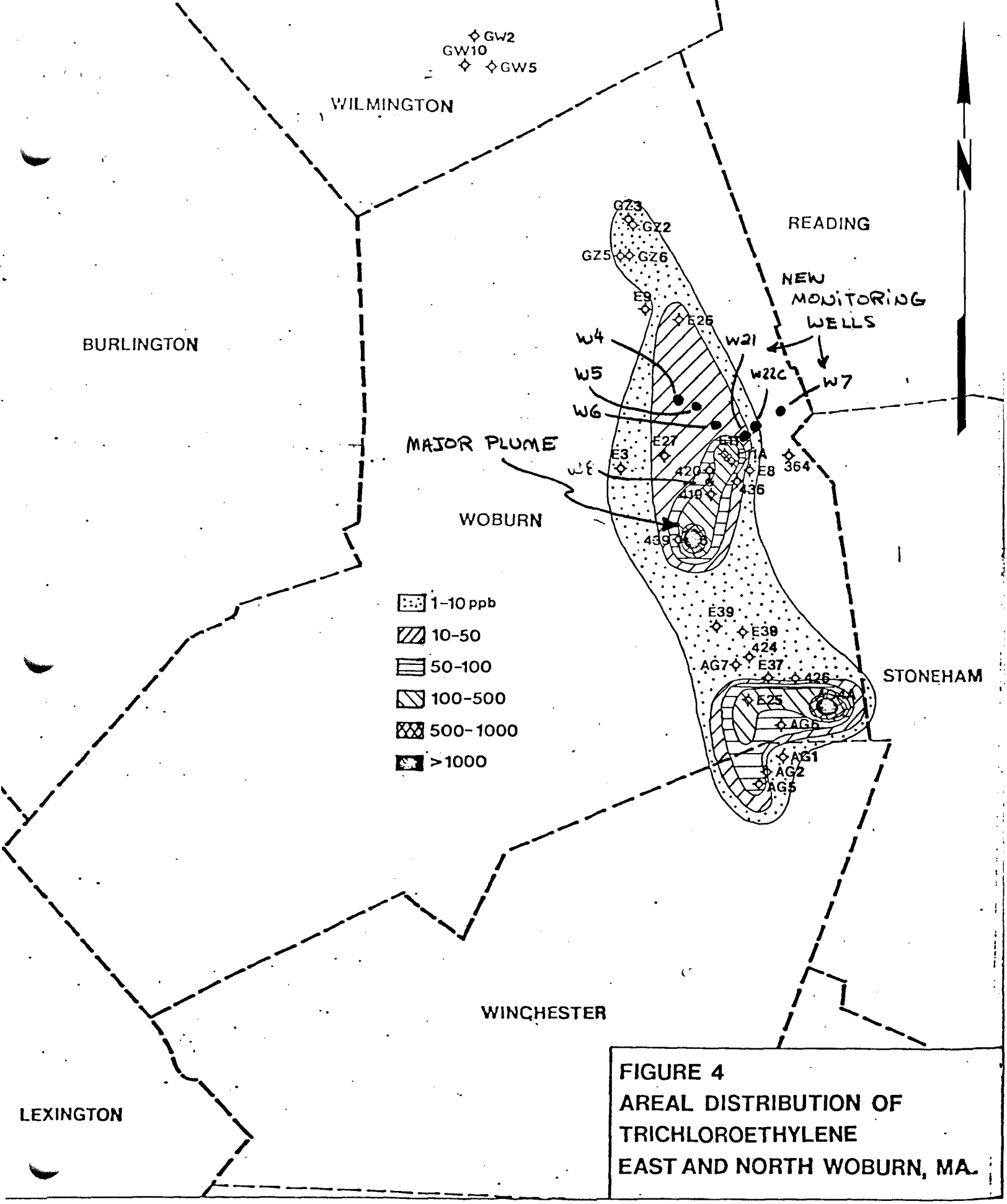

FIGURE 4
AREAL DISTRIBUTION OF
TRICHLOROETHYLENE
EAST AND NORTH WOBURN, MA.

TABLE 1

ANALYSIS OF SAMPLES FROM MONITORING WELL W21 *

Date	Depth of Sample	Compound	Levels (estimated)
9-11-81	0-1 feet	ND[1]	
9-11-81	4-6 feet	ND	
9-11-81	9-11 feet	TCE[2]	10-20 ppb
9-11-81	14-16 feet	TCE	20-50 ppb
9-11-81	Washwater	ND	
9-11-81	19-21 feet	TCE	100-200 ppb
9-14-81	washwater	TCE	100-200 ppb
9-14-81	19-21 feet[3]	TCE	100-200 pbb

* Well W21 is installed in the plume area, upgradient of the highest reported concentrations.

1. Not Detected

2. Trichloroethylene

ANALYSIS OF SAMPLES FROM OTHER NEWLY INSTALLED MONITORING WELLS

Date	Type/Depth	Well #	Compound	Levels (estimated)
9-28-81	Groundwater	W4	ND	
9-28-81	Groundwater	W5	1,1,1-trichloroethane	200-500 ppb.
9-28-81	Groundwater	W6	Tetrachloroethylene Trichloroethylene	1000-1500 ppb 10 ppb
9-28-81	Groundwater	E41	Toluene	50 ppb
10-2-81	Soil/34-35 ft.	W22C	Trichloroethylene	10-25 ppb
10-2-81	Groundwater	W22C	Trichloroethylene	100 ppb
10-2-81	Groundwater	W21	Trichloroethylene	1500 ppb
10-2-81	Groundwater	W7	ND	

SECTION 5 - CONCLUSIONS AND RECOMMENDATIONS

The initial round of sampling and analysis of existing wells detected a major plume of trichloroethylene encompassing wells 439, 6, 419 (Woburn municipal well G), 420 (Woburn municipal well H), E11 and E11A. Groundwater flow moves from north to southeast through the study area. Therefore, the source or sources of trichloroethylene contamination must be located upgradient (north, northwest, or northeast) of the contaminated wells.

In order to further define the plume boundaries, monitoring wells W4, W5, W6, W7, W21 and W22C were installed. See Figure 4 for the locations of these wells. During the installation of monitoring well W7 trichloroethylene was not detected either in soil samples or in the groundwater. At well W21, trichloroethylene was detected in soil samples from nine feet below the surface (10-20 ppb) down to the bedrock surface at 21 feet (100-200 ppb). A sample from well W21 taken two weeks after installation contained approximately 1500 ppb of trichloroethylene. overburden materials at both W7 and W21 consist of relatively permeable fine-to coarse-grained sands with minor silt and gravel underlying 10-20 feet of artificial fill (as coarse sands). Because the possibility existed that the artificial fill itself was the source of contamination, a third monitoring well, W22C, was installed just northeast of W21. This site was chosen because of its undisturbed nature (no buildings on site as far back as 1938 and therefore not likely subject to artificial fill)

Ten to 25 ppb of trichloroethylene was detected at well W22C in decomposed bedrock material at a depth of 34 to 36 feet. The bedrock surface is at 37 feet. Overburden consisted chiefly of a compact sandy till. After installation of the well, two volumes of the well were purged and a sample taken which contained approximately 100 ppb of trichloroethylene.

5. Conclusions and Recommendations - continued

Soil samples from upgradient monitoring wells W4, W5, W6 and W7 did not show evidence of trichloroethylene when the wells were installed during July and August 1981. Groundwater samples taken during the week of September 28, 1981 from wells W4, W5 and W7 did not show the presence of trichloroethylene. Ten (10) ppb of trichloroethylene were detected in well W6.

From the preliminary findings presented here, the Region I FIT suggests that the source or sources of the trichloroethylene contamination are most likely located northeastward of wells W21 and W22C but not further north than the bedrock high at the intersection of Routes 128 and 93 (Figure 5).

The water table and bedrock surface configurations shown in Figures 2 and 3 in conjunction with the pattern of monitoring well contamination described above indicate that the source of contamination is most likely northeast of and very near to well W22C. If the source was located further upgradient, then compounds detected at W22C and W21 would also be present in wells W5, and W6.

Future work to be performed for the Woburn Study includes a second round of priority pollutant scan analyses including the newly installed monitoring wells to provide more accurate data on the identity and concentrations of contaminants.

It is recommended that the U.S. EPA make appropriate inquiries of industries within the potential source area to determine if any additional information is available regarding potential source or sources. Should no useful information be gained by this approach, a full field investigation of the potential source area should be conducted.

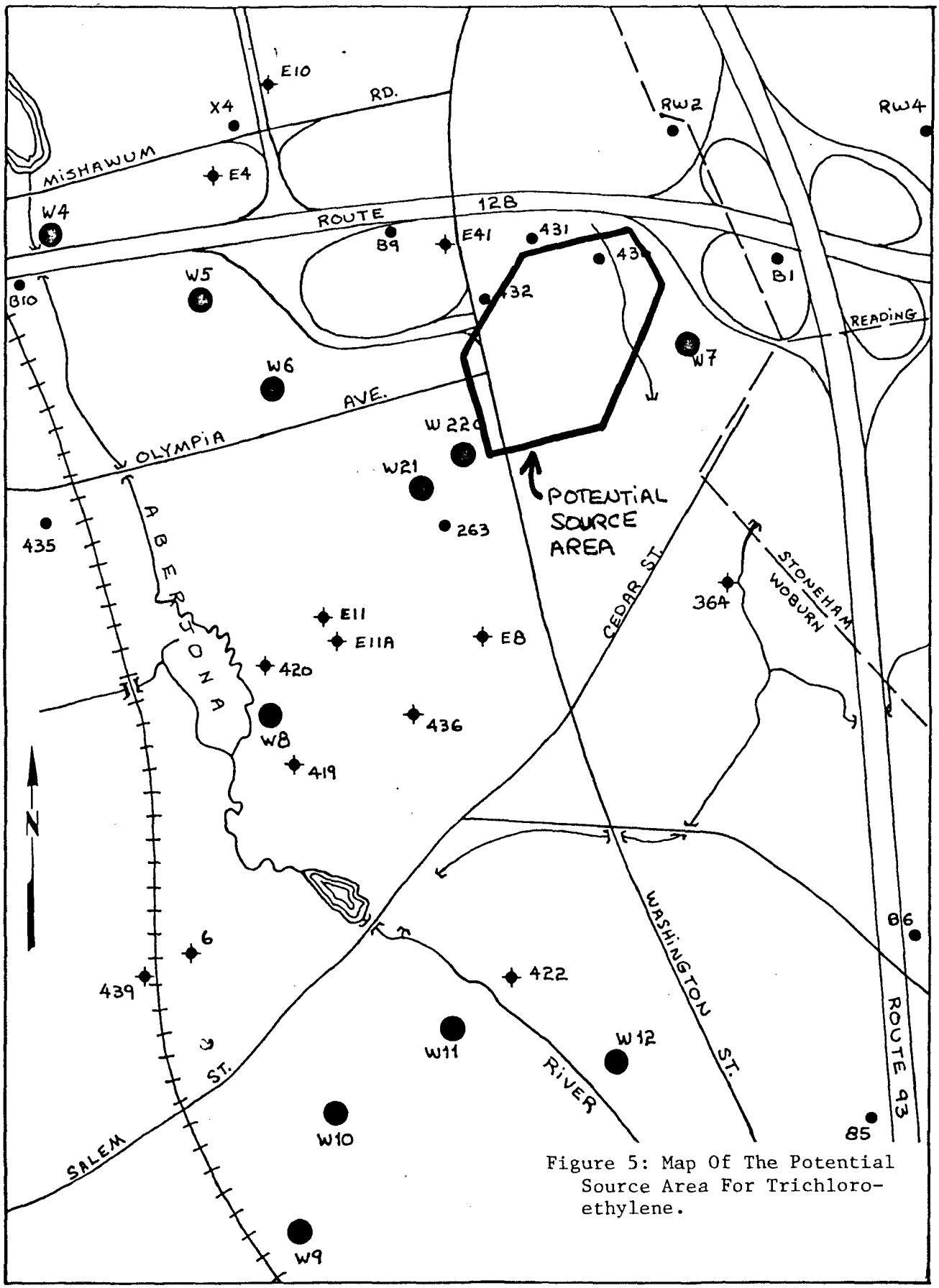

Figure 5: Map Of The Potential Source Area For Trichloroethylene.